CHAPTER I

INTRODUCTION

1.1 Statement of Problem

The lack of autologous skin grafts, especially on patients suffering from extensive burns, has fueled the development of alternative skin grafts over the past decades. A number of commercial skin replacement products are now available, which use a variety of synthetic bioresorbable and natural biodegradable matrix materials.

Collagen is one of the most important natural biological macromolecules of the extracellular matrix in tissues, and has been used successfully to produce commercialized biomaterials for a wild range of application. Chitosan, natural biodegradable and antibacterial polymer, has been investigated as a possible wound-healing accelerator and its oligomer degraded by tissue enzymes were found to be effective in regenerating the skin tissue of wound area.

Development of biodegradable polymer having desirable cellular responses has been considered to be of great interest in the field of biomedical applications, especially tissue engineering of skin. Polycaprolactone (PCL), an aliphatic polyester, is an ideal candidate due to its biodegradability and biocompatibility. However, its hydrophobicity often leads to unfavorable cell adhesion and growth. Therefore, the cytocompatibility of PCL should be improved.

Surface modification has long been recognized as a potential tool to enhance biocompatibility of material's surface, the part mainly interacts with living cells. Since hydrophilic and protein-containing surfaces are known to be good for cell growth, this research concentrates on improving surface hydrophilicity of PCL by aminolysis of 1,6-hexamethylenediamine or graft copolymerization of acrylic acid and using amino or carboxyl groups introduced on PCL surface as precursors for covalent immobilization of two selected bimolecules–collagen and chitosan. The purpose of which is to render PCL a suitable material for artificial skin application.

1.2 Objectives

1. To immobilize biomolecules on the surface of polycaprolactone containing amino and carboxyl group.
2. To study the cytocompatibility of biomolecule-immobilized polycaprolactone with skin cells.

1.3 Scope of Investigation

The stepwise investigation was carried out as follows

1. Literature survey for related research work
2. Preparation of polycaprolactone film
3. Introduction of amino groups onto polycaprolactone film surface by aminolysis
4. Activation of introduced amino groups with disuccinimidylcarbonate and immobilization of biomolecule
5. Introduction of carboxyl groups onto polycaprolactone film surface by graft copolymerization.
6. Activation of introduced carboxyl groups with *N*-hydroxysuccinimide/ 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride and immobilization of biomolecule
7. Determination of cytocompatibility of biomolecule-immobilized polycaprolactone films with skin cells